Water on Deployment

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Outline

- Why we are talking about water today
- Quantities required on deployment
- Overview of methods of purification
- Systems for ensuring safe water

The handouts lists useful references

What's so Special about Water?

- Essential to the Mission
- Contamination "invisible"
- Great potential to affect large numbers
  - Inadvertent contamination & sabotage
- Bulky & heavy, but need it in great quantities
- Logistical problems in production & transport
- Costly

Why Do *You* Need To Know?

- Oversight of your team
- It could be you instead of a hygienist:
  - Initial planning
  - Site survey
  - Vulnerability Plan
  - Monitoring
- Contingencies:
  - Contamination, outbreak investigations, NBC ops
- *It could be your butt on the line!*

Uses

- Drinking
- Cooking
- Washing
- Sewage
- Laundry
- Medical
- Industrial
- Decontaminatio..

Quantity

FUNCTION	WATER USAGE FACTOR (gal/person/day)
Potable Water	
Drinking	4.0
Personal Hygiene	2.7
Shower	1.3
Food Preparation	3.0
Hospital	1.0
Heat Treatment	1.0
Non-potable Water	
Laundry	2.0
Construction	1.0
Graves registration	0.2
Vehicle Operations	0.3
Aircraft Operations	2.0
10% Loss Factor	(1.5)
TOTAL	20.0

Quantity

- Hospitals: for potable water allow 65 gal/bed/day and an additional 10 gal/staff person/day (AFPAM 10-219 Vol 5)
  - But more generous than the current EMEDS figures
- EMEDS potable water requirements:
  - Basic (25 staff): 400 gal/day
  - +10 (40 staff): 800 gal/day
  - +25 (86 staff): 1430 gal/day

Definitions and Standards

- Potable:
  - Free from pathogenic organisms, poisons, chemical or biological agents, and radioactive contaminants
- Palatable:
  - Pleasing in appearance and taste
- Standards
  - EPA
  - US joint service (TB Med 577)
  - QSTAG 245 & STANAG 2136

Non-potable Water Uses

- Disinfected non-potable fresh water
  - Decontamination of personnel, retrograde cargo washing, heat casualty body cooling, graves registration sanitation
- Non-potable fresh water
  - Vehicle coolant, aircraft washing, pest control, field laundry, concrete construction
- Sea water
  - Vehicle washing (may lead to corrosion), electrical grounding, fire fighting, NBC decontamination of material/equipment
- Showering??

Sources of Water

- Existing potable source
- Surface water
- Ground water
- Bottled

Making it Potable

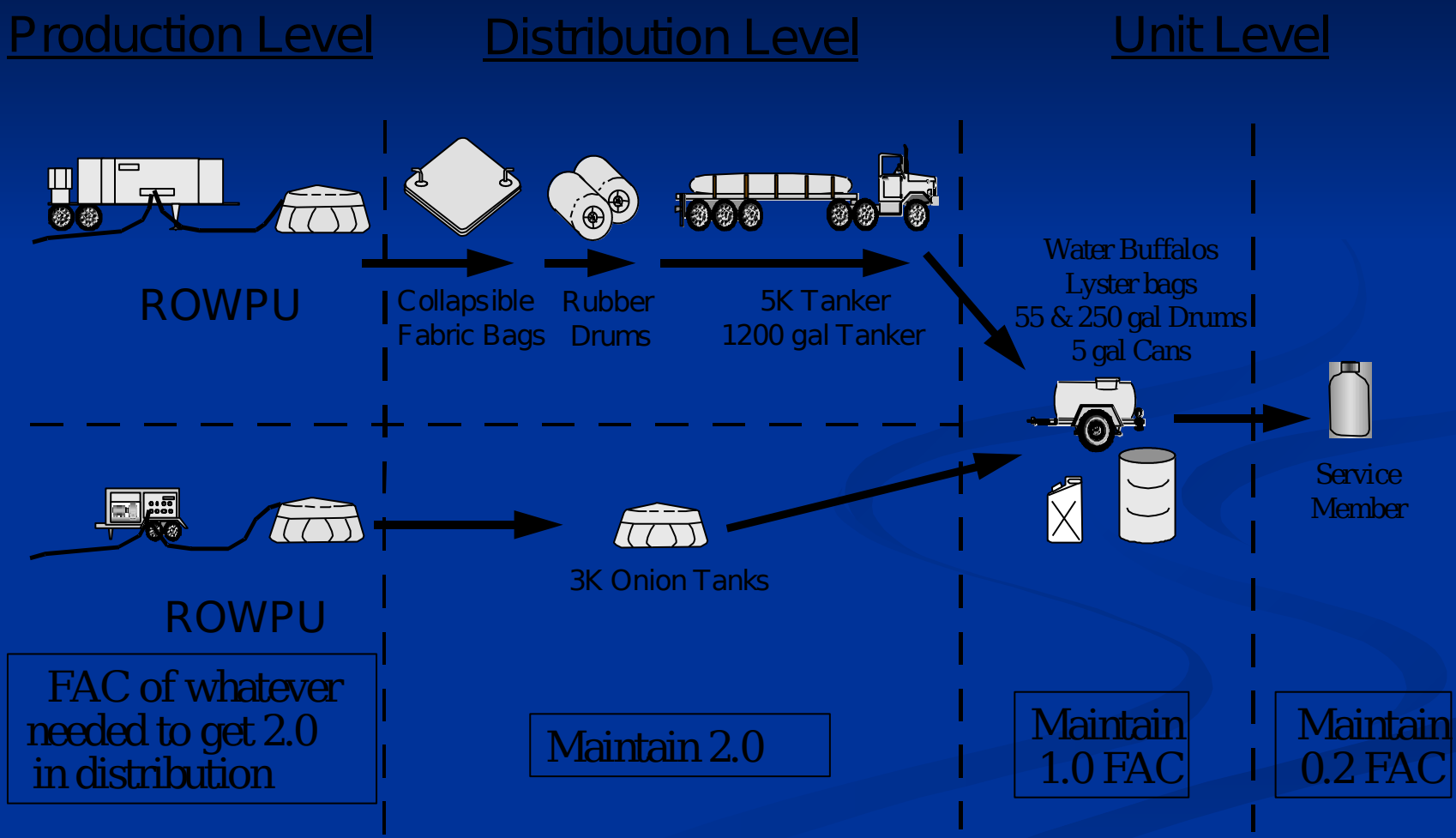
- Boiling
- Filtration
- Disinfection
  - Iodine
  - Chlorine
  - Chlor-Floc
  - Miox
- Reverse Osmosis

ROWPU

- Deployable units
  - Various sizes/capabilities from trailer-mounted 600 gal/hr unit to 10x greater p

Occ Med Interlude

Disinfection of Field Water Supplies



Site Survey

- CE lead but team includes Bioenvironmental Services (BES)
  (BEE, PH, or Flight surgeons/PM docs)
- Consider both quantity & quality of source
- Quantity sufficient?
  - Rule of thumb: 20 gal/man/da

Site Surv

- Quality:
  - **Contamination**. eg sewage, industrial toxins
  - **Security** against sabotage
  - **Palatability**. ie turbidity, odour, taste, colour
  - Can it be treated with **resources** available
  - **Accessibility** for the treatment equipment
  - **Isolated** suitably from sources of contam on base
    - eg latrines at least 100 yds downstream or downgradient

Vulnerability Plan

- Because the water supply is mission critical
- Detailed defence and recovery from attack plan
- Lead by BEE
  - Team includes other experts, eg CE & security
  - Prev med doc should be involved to ensure the medical aspects of the plan are adequately addressed
- May need to be classified
- Skeleton plan given in the handout

Testing & Certification

- Initially consider the water unsafe until tested
- Water Production/Distribution staff check:
  - Source water chlorine demand — Daily
  - Chlorine residual, pH, temp, TDS, turbidity — Every *30 mins* at production; *Hourly* at storage & distribution points; *Daily* at water trailers & drums

Testing & Certificati

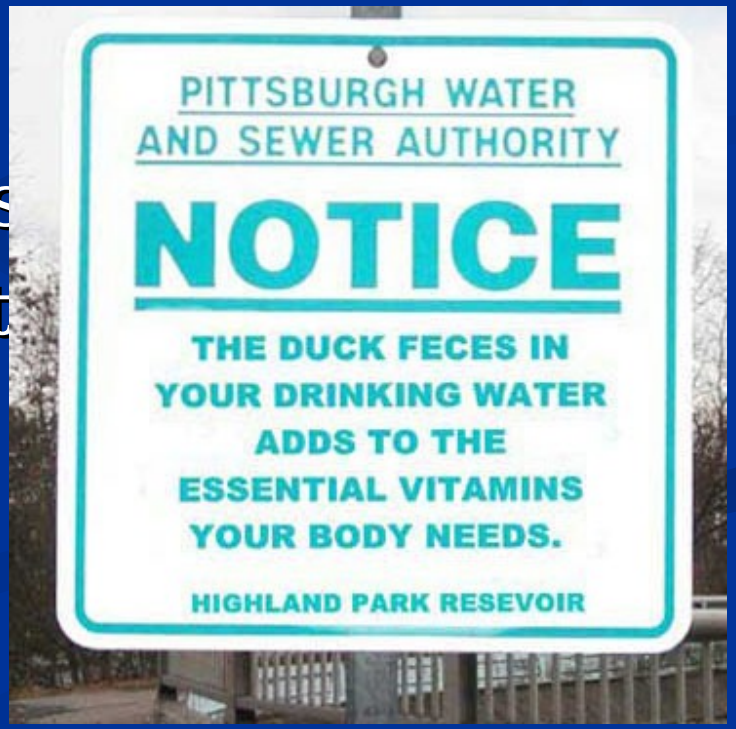
- BEE develops sampling plan and checks:
  - *Weekly*: All parts of the system for chlorine demand & residual
    - If no free chlorine then test for microorganisms
  - *Monthly to hourly*: Chemical warfare agents
  - *Monthly*: Bacteriological testing of ac water supplies
  - *6-monthly*: All properties of the water iaw standards
  - *Periodic*: Inspect the water system

Sampling Plan

- Enables the BES to meet testing requirements
- A systematic approach to QA of the water
- Two critical elements:
  - Protection of large water users & critical personnel
  - Rapid identification & isolation of contamination
- Very detailed. eg where, when & how to sample
- Use QA sampling:
  - Duplicates, known positives, trip blanks

Positive Sample

- Total coliform is an indicator of a problem
- Confirmatory test: fecal coliform
- If positive:
  - Shutdown & isolate sys
  - Resample up & downst
  - Superchlorinate



Bottled Water

- Source needs approval by
  - US Army Vetinary Corps
  - National Sanitation Foundation
  - Air Force Public Health or BEE Office

- PH/BEE tests bottles water on receipt:
  - At Theatre issue point: coliforms
  - At bulk store: visual inspection

Don’t Forget

- Ice:
  - Weekly bacteriological monitor
- Recreation:
  - Swimming pools & hot tubs
  - Natural bathing area

Summary

- Water supply is mission critical
- Ensuring safety has basic principles but the execution is very detailed
- MO should understand basic process to:
  - Oversee the BEE/PH staff
  - Advise commanders of issues
  - Outbreak investigation
  - Know when to seek help if on your own!

Questions?

Miox Pen

- Kill things you can't pron
  with technology you don't
  understand
- Mixed oxidant solution
  - Hypochlorous acid
  - Other chlor-oxygen species
- 30 min: bac, viruses & gia
- 4 hrs: crypto

Drinking Water System
Disinfectio

- pH Measurement

Why?

- Chlorine form dependent on pH
  - HOCl (80 times more effective than OCl)
  - pH of 5-6.5 is most effective

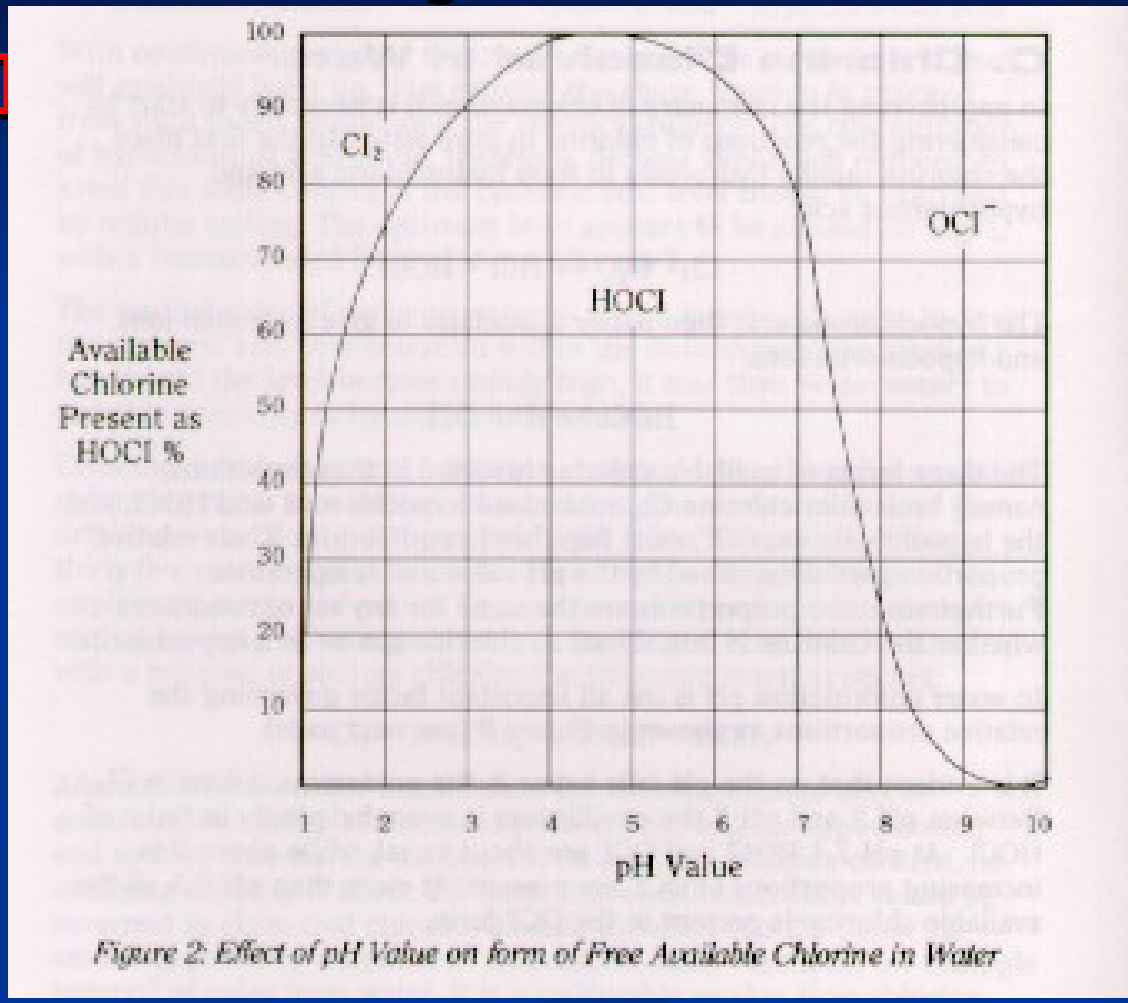


Figure 2: Effect of pH Value on form of Free Available Chlorine in Water